

In the Specification

Please delete the paragraph beginning on page 2, line 28 and replace it with the following paragraph:

It is a further object of the present invention—is to provide a method of manufacturing a heat exchanger which requires less critical dimensional tolerances.

Please delete the paragraph beginning on page 5, line 14 and replace it with the following paragraph:

Yet another aspect of the present invention provides a method of making a heat exchanger comprising an initial step of providing a header defining openings having an inner surface. The method further includes providing a plurality of grommets which may include cured silicone rubber. The grommets define openings having inner surfaces and are adapted to receive a plurality of tubes. The grommets are adapted to fit into the openings in the header. Then, the method includes inserting the tubes into the grommet openings such that the inner surfaces of the grommet openings and outer surfaces of the tubes are adjacent to each other. Next, the method includes applying substantially un-cured sealing material to at least the inner surfaces of the ~~grommets~~-grommet openings such that the inner surfaces of the openings of the grommets and the outer surfaces of the tubes are connected by the sealing material. Finally, the method includes curing the sealing material after the tubes are inserted into the grommet openings, the sealing material provides a flexible, bonded, liquid tight, tube-to-grommet joint. The grommet may be bonded to the header, or bonded to both the header and the tube outer surface.

Please delete the paragraph beginning on page 7, line 6 and replace it with the following paragraph:

A further aspect of the present invention provides a heat exchanger which comprises a plurality of tubes having predetermined dimensions. The tubes include an outer surface and are open at one end. A header structure defines a plurality of openings ~~were~~ where the openings are adapted to receive the tubes. A plurality of elastomeric sealing joints preferably including a silicone bonding material, are positioned between the outer surface of the tubes and the header, where the sealing joints are bonded to the outer surface of the tubes and the header.

Please delete the paragraph beginning on page 10, line 6 and replace it with the following paragraph:

In describing the preferred embodiments of the present invention, reference will be made herein to Figs. ~~4-10~~ 1-11 of the drawings in which like numerals refer to like features of the invention. Features of the invention are not necessarily shown to scale in the drawings.

Please delete the paragraph beginning on page 10, line 22 and replace it with the following paragraph:

Referring to Figs. ~~4-10~~ 1-11, all the embodiments of the present invention use high temperature silicone sealants to form joint seals of either the formed-in-place or cured-in-place types. Cured-in-place seals are created by applying sealing material (typically high temperature silicone sealants) as a liquid to a sealing surface of one part, and then curing the sealing material, usually by ultraviolet light, resulting in an elastomeric material bonded to the surface before assembly of the part to another part.

Sealing is accomplished during assembly by compression of the cured elastomeric material between the sealing surface of the first part and the sealing surface of the second part. Thus, the parts are assembled with the silicone in a cured condition, but already bonded to one sealing surface. Loctite 5960 FastGasket silicone is an example of such a U/V-cured material.

Please delete the paragraph beginning on page 11, line 3 and replace it with the following paragraph:

In contrast, formed-in-place seals are created by applying sealing material (high temperature silicone sealants) as a liquid to one or both sealing surfaces, typically after assembly of the parts. Then, the sealing material is cured, usually by room temperature vulcanization (RTV), but also by the use of ultraviolet light or heat. Sealant can also be applied before assembly of the parts and cured after the components are assembled. Loctite 5920 Ultra Copper™ RTV, is an example of an RTV silicone material with a working temperature range of ~~-65F to +600F~~ -65°F to +600°F.

Please delete the paragraph beginning on page 11, line 10 and replace it with the following paragraph:

The present invention, shown in Figs. 1-~~10~~11, and described herein, provides a bonded, resilient, liquid-tight positive seal or sealing joint that can be used with the aforementioned heat exchangers described in the Background of The Invention. It may also be incorporated with any existing or new grommet design to assure a positive bonded seal. The application of the seals includes tube to header joints and header to tank joints. Producing a liquid-tight flexible seal may be done before or after assembly depending on the embodiment.

Please delete the paragraph beginning on page 11, line 24 and replace it with the following paragraph:

In Figs. 1a and 1c the header 14 also includes a first angular portion 20 adapted to receive the silicone bead 16. Liquid silicone is applied to the top surface of the first angular portion 20 before or after insertion of the ~~tubes 12~~tubes 12. When the silicone is applied before the tube is inserted the silicone is cured-in-place before the tube is inserted. The direction of the angular portion 20 enables greater build-up of silicone between the tube and the header resulting in more surface area of the silicone bead 16 being in contact with the tube 12 outer surface 25. The bead 16 is adjacent to the tube 12 and frictionally secures the tube 12.

Please delete the paragraph beginning on page 14, line 16 and replace it with the following paragraph:

The method of the present invention includes, referring to Figs. 2a-2b, using a cured-in-place seal resulting in a tube-to-header joint 13, 24, respectively. The liquid silicone is applied beneath the angular portions 22, 23 and then cured to form silicone beads 16. The tubes 12 (not shown) are inserted through the opening defined by the ~~beads 15~~beads 16 and the mandrel 29, which is slightly smaller than the diameter of the tube 12, resulting in compression fit liquid tight sealing joints 13, 24 between the headers 14 and the tubes 12.

Please delete the paragraph beginning on page 16, line 19 and replace it with the following paragraph:

The embodiment shown in Fig. 5 of the present invention, is a significant and material departure from current flexible tube-to-header joints. In a preferred embodiment, the tubes are fixedly attached to the header, and the header is resiliently attached to the tank. The present invention provides an advantage of having a flexible tank to header joint which will not crack or cause damage to any of the components when the header-tubes combination is moved or flexed, or the tank moves. The present invention, as illustrated in ~~Fig.5~~Fig. 5, provides a flexible joint between the tank 44 and the header 51 which allows for movement between the tank 44 and the header 51 having fixedly attached tubes 17. In a specific case, when the tank is secured to another structure limiting the tanks movement, the flexible joint 54 allows resilient movement between the tank 44 and the header 51 with fixedly attached tubes 17.

Please delete the paragraph beginning on page 17, line 6 and replace it with the following paragraph:

Referring to Fig. 6, a joint assembly 60 is shown which includes a side column 62, a tank 44, curved header 68, tubes 12, and fins 52 of a core 64. The manifold-62 can be welded or bolted to a rigid structure side column 62 so that mounting can be accomplished. The curved header 68 defines wells 66 which provide slightly oversized holes designed to receive the tubes 12. The curved header arcs downwardly when adjacent to the tube openings. The arcing forms wells 66 between the header portions defining the wells 66. After the tubes are inserted, and liquid silicone is applied to create formed in place seals, the wells 66 in the header 41 provide a lengthened silicone bond 65 between the tubes 12 and the header 41 for better sealing.

A thin layer of 600F RTV silicone 63 is over the entire header 41 which forms a bond between the header 41, the tank 44 and the tubes 12. The side column 62 is welded or bolted to a side of the tank 44 to form a rigid structure. The header and tank can flex with respect to each other while the resilient tube to header sealing joints 65 also flex.